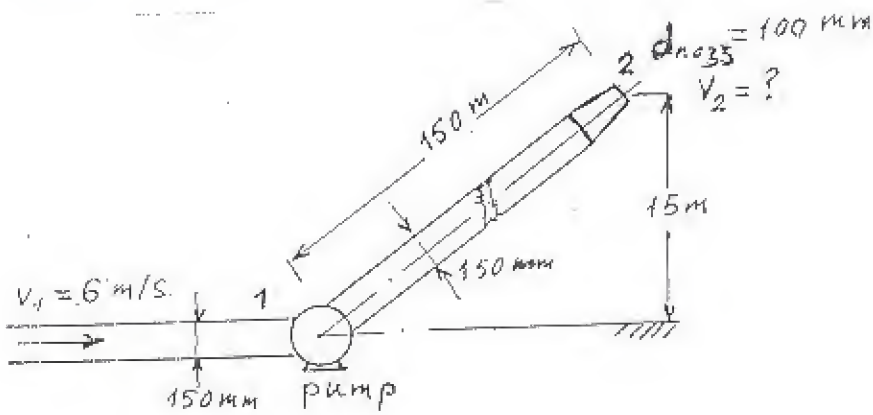
4. A flow has a potential function $\phi = V_0(x^3 - 3xy^2)$, derive the corresponding stream function ψ and show that some of the streamlines are straight lines passing through the origin of coordinates. Find the inclinations of these lines. Evaluate also the magnitude and direction of the velocity at an arbitrary point: x, y.

5. Water is pumped from reservoir through 150 mm diameter pipe and is delivered at a height of 15 m from the center line of the pump through a 100 mm nozzle connected to 150 mm discharge line as shown in figure. If the pressure at the pump inlet is 210 kN/m^2 absolute, inlet velocity of 6 m/s and the jet is discharged to atmosphere. Determine:
- the energy added by the pump per unit weight of water flowing, Ep.
- the needed pump power.
- the force exerted by the flowing water on the pipe bend between sections 1 & 2.

Assume atmospheric pressure as 101 kN/m^2 and no friction. $S_w = 1000\ kg/m^3$.



جامعة طنطا - كلية الهندسة
قسم هندسة القوى الميكانيكية
الاقتصاد الهندسي – ثالثة ميكانيكا قوى

الزمن : ساعتين
يناير 2009-2008

أجب على الأسئلة التالية

السؤال الأول

أ - ماهي التكاليف الثابتة والمتغيرة للمشروع وفيما تستخدم نقطة التعادل؟ مع توضيح ذلك بالرسم؟

ب - ماهي المصروفات السنوية المنشأة مع الشرح؟

ج- ماهو المبلغ الذى يجب استثماره فى الوقت الحالى فى حالة 5% ليكون كافيا للحصول على 12000 $ فى 5 سنوات من الان و 12000 $ فى 10 سنوات من الان و 12000 $ فى 20 سنة من الان؟

السؤال الثانى

يريد مصنع اضافه موقع جديد للمنشأة لمواجه الطلبات المتراكمه والمتزايدة الحاليه. فاذا كانت التكلفه الثابته 9200$ فى الشهر وكانت التكلفه المتغيره 70 سنت cents لكل وحدة منتجه ، وكان متوسط سعر المنتج 90 سنت.

[أ] ما هو حجم الانتاج المطلوب فى الشهر لتحصل على التعادل؟
[ب] ما هو الربح الذى يمكن ان يتحقق شهريا اذا كان حجم الانتاج
(1) 61000 وحدة، (2) 87000وحدة؟
[جـ] ما هو حجم الانتاج المناسب للحصول على ربح قدرة 16000$ فى الشهر؟
[د] ما هو حجم الانتاج المطلوب لتحصل على عائد بيع مقدارة 23000$ فى الشهر ؟
[هـ] ارسم العلاقه بين التكلفه الكليه والعائد من المبيعات ؟

السؤال الثالث

شركة تنتج ثلاث منتجات X, Y, Z الجدول الموضح يبين عناصر التكاليف السنوية والاحتياجات السنوية من ساعات التشغيل الآلي لهذا المستوى الإنتاجي :-

تفصيلات التكاليف السنوية	المنتجات		
	X	Y	Z
تكاليف المواد المباشرة $(L.E.)$	1300	1500	2000
تكاليف العمالة المباشرة $(L.E.)$	1000	1200	1800
عدد ساعات التشغيل الآلية (hr)	300	500	650
عدد المنتجات (وحدة فى السنة)	600	800	1200

فاذا كانت مجموع المصروفات العامة (الثابتة Overhead Costs) السنوية لهذه الشركة هى $(5000\ L.E.)$ والمطلوب هو : حساب التكلفة الكلية لوحدة الإنتاج من كل نوع , وذلك باستخدام طريقتين مختلفتين من طرق توزيع المصروفات العامة المختلفة

السؤال الرابع

أ- ماهي الحالات الثلاثة لاتخاذ القرار مع الشرح؟
ب- ماهي انواع دراسات الجدوى الاقتصادية مع الشرح؟
ج – اذا اشترت احدى الشركات معدة بمبلغ 7000 جنيه وكان عمرها الافتراضى 6 سنوات وبيعت فى نهاية عمرها الافتراضى بمبلغ 1000 جنيه أوجد القسط السنوى للاهلاك والقيمة الدفترية فى السنة الرابعة باستخدام طريقة مجموع السنوات؟

ميكانيكا قوى ف ٢

TANTA UNIVERSITY
FACULTY OF ENGINEERING
PRODUCTION ENG. & MECH. DESIGN DEPT.

THEORY OF MACHINES
2nd YEAR, 2008-2009
TIME: 3 HOURS

FINAL TERM EXAM

1- The driving and the resisting torque for a machine are shown in Fig. 1. The machine speed is 300 *rpm*. Find the moment of inertia of the flywheel, if the total speed variation is 3%. Also, find the maximum angular acceleration.

(Mark 15%)

2- a) Is it possible for a pinion with 16 teeth and a pressure angle of 20° to drive the following and why?

1- A rack 2- A gear with a gear ratio of 3.

b) For the gear train shown in Fig. 2, gears C and D are one unit. If the input shaft rotates at 1000 rpm (cw) and gear F is held fixed, find the speed of the output shaft.

(Mark 25%)

3- Draw the cam profile to give an oscillating roller follower the following motion:

a- Outward motion through an angular displacement of 25° during the first 120° of the cam rotation with cycloid.
b- Dwell motion during the next 60° of the cam rotation.
c- Return motion to its initial position during the next 120° of the cam rotation with S.H.M. motion.
d- Dwell motion during the next 60° of the cam rotation.

The minimum radius of the cam is 50 mm. The location of the pivot of the follower is 70 mm to the left and 60 mm above the axis of rotation of the cam. The distance between the pivot center and the roller center of the follower is 70 mm. The radius of the roller of the follower is 10 mm.

(Mark 20%)

4- For the mechanism shown in Fig. 3, the eccentric circular cam with radius 25 mm and eccentricity 15 mm rotates at uniform angular velocity of 20 rad/sec (cw). The oscillating flat face follower is in the horizontal position.

a- Locate all instantaneous centers, and then find the angular velocity of the follower 3 and velocity of the block 4.
b- Using the relative motion method, find the velocity and the acceleration of the block 4 and the angular acceleration of the follower 3.

(Mark 30%)

5- For the mechanism shown in Fig. 3, find the driving torque of the cam 2, if a resisting force F=500 N is acting vertically upward on the slider 4.

(Mark 15%)

Dr. Samy F. M. Assal

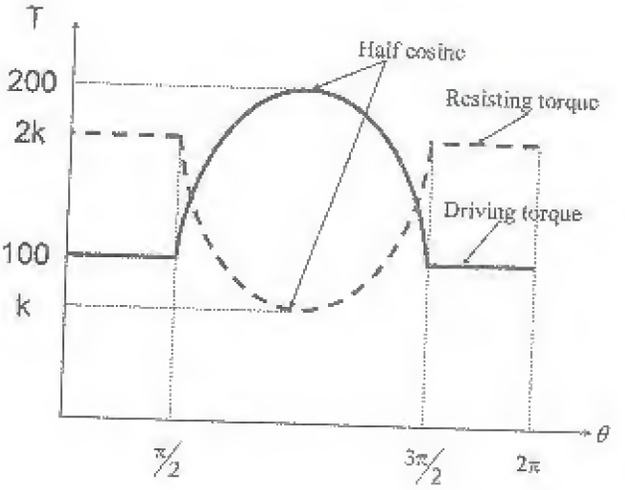


Fig. 1

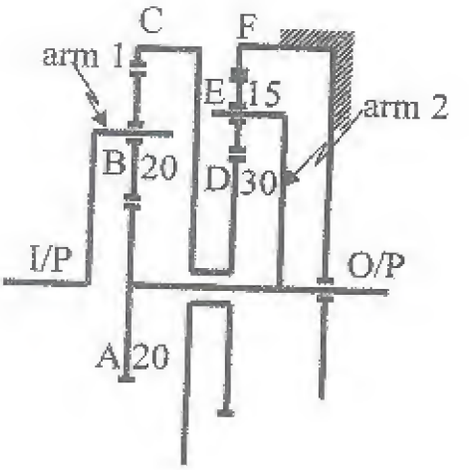
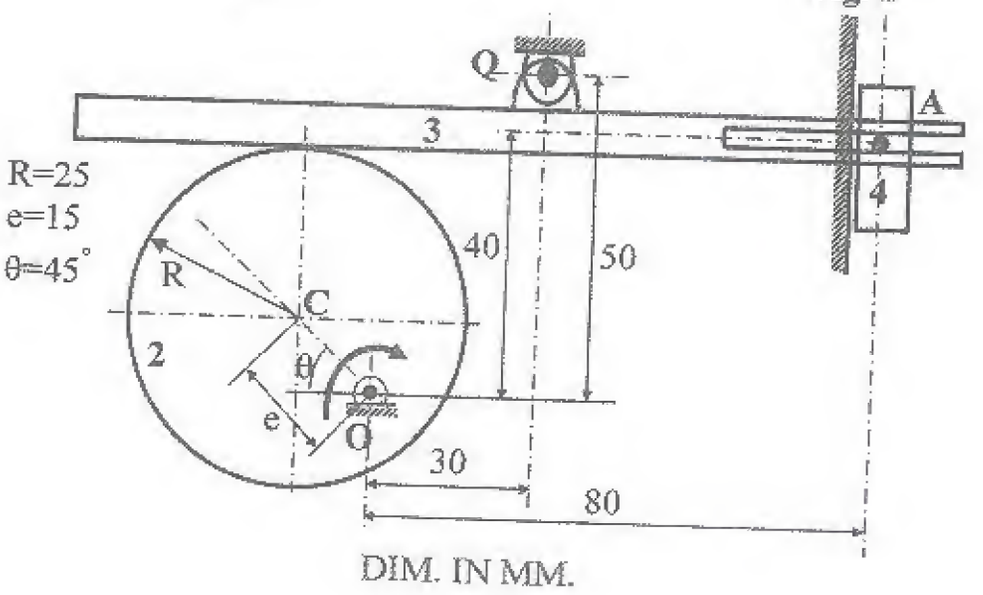


Fig. 2



DIM. IN MM.

Fig. 3

الفرقة الثانية ميكانيكا قوي(لائحة قديمة)
المادة ديناميكا حرارية
الزمن: ٣ ساعات

جامعة طنطا- كلية الهندسة
امتحان الفصل الدراسي الأول
٢٤-١-٢٠٠٩

Answer the following questions:-

The first question:

a- What are the Carnot principles ?

b- Show that the Kelvin-Plank and Clausius statements of the second low are equivalent?

c- Two reversible engine A & B operate in series between 1000 K and 400 K. The engines thermal efficiencies are equal. The heat received by engine A is 500 kJ. Determine: (a) the temperature of the heat rejected by engine A.
(b) the work of engine A and B.
(c) the heat rejected by the engine B.

The second question:

a- Define : excess air, higher and lower calorific values.

b- Explain how to determine the calorific value of a solid fuel?

c- A sample of coal having a calorific value of 29700 kJ/kg has a composition by mass of: C 80%; H_2 4%; O_2 5%; S 2%; N_2 3%; remainder ash. When the coal was burned in a furnace with 60% excess air the temperature of the flue gases entering the stack was 316 °C. for an atmospheric temperature of 15 °C, determine, (a) the actual mass of air supplied per kg of fuel. (b) the percentage of the heat energy released that is carried away by the flue gases.

The third question:

a- What are the clearance volume, compression ratio and mean effective pressure for reciprocating engines ?

b- How does the ideal Ericsson cycle differ from the Carnot cycle?

c- An ideal Diesel cycle with air as the working fluid has a compression ratio of 18 and a cut off ratio of 2. at the beginning of the compression process, the working fluid is at 100 kPa, 27 °C and 2000 cm^3. Determine (a) the temperature and pressure of air at the end of each process, (b) the net work output and the thermal efficiency and (c) the mean effective pressure?

The forth question:

a- Why is Carnot cycle not a realistic model for steam power plants?

b- What is the cogeneration cycle?

c- A combined power plant consists of turbine unit and a steam turbine unit, the exhaust gas from the open-cycle gas turbine is the supply gas to the steam generator of the steam turbine cycle at which additional fuel is burned in the gas, the pressure ratio for turbine is 7.5, the air inlet temperature is 15 °C , and the maximum cycle temperature is 750 °C, combustion in the steam generators raises the gas temperature to 750 °C and the gas leaves the generators to the chimney at 100 °C. steam is supplied to the steam turbine at 50 bar, 600 °C, and the condenser pressure is 0.1 bar. The isentropic efficiencies of the air

compressor, gas turbine, and steam turbine are 83%, 86% and 85% respectively.

Taking the specific heat and the specific heats ratio of the combustion gases as 1.11 kJ/kg.K and 1.33 respectively and neglecting the effect of mass flow rate of fuel, feed- pump work, and all pressure losses, calculate:

(a) the required flow rates of air and steam for a total power output of 200MW.

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For refrigerant- 134a these data can be taken:

T (°C)	h_f (kJ/kg)	h_g (kJ/kg)	s_f (kJ/kg.K)	s_g (kJ/kg.K)
-6	43.84	246.91	0.17489	0.93497
32	96.48	267.62	0.3573	0.91811

ميكانيكا موائع هيدرو ٢٠٠٩/١١/١٤

العام الخامس ٢٠٠٨/٢٠٠٩
الفصل الدراسي الأول
السنة الدراسية : الثانية
الزمن : ٣ ساعات

جامعة طنطا كلية الهندسة
قسم هندسة القوى الميكانيكية

التخصص : هندسة القوى الميكانيكية
المادة : ميكانيكا موائع (٢)

عدد الصفحات : ٢ عدد الأسئلة : ٥ أجب على جميع الأسئلة

1.a) Derive the Work-Energy equation using the control volume concept.

b) Derive the Euler equation for 2-D steady flow in vertical plane.

c) Using the derived Euler Equation, derive the Bernoulli's equation for 2-D incompressible steady flow

2.a) Using the control volume concept, derive the law of mass conservation (Continuity equation) for 1-D steady flow.

b) Define with help of drawing: the stream function and velocity potential in cartesian coordinate system, then express and analyze the continuity equation and vorticity in terms of stream function and velocity potential.

c) Derive the fundamental equation of fluid statics relates pressure, density and vertical position in a fluid.

3.a) Determine the resultant liquid pressure force (magnitude, direction and point of action) acting on an inclined plane surface submerged in liquid.

b) Draw and assign the velocity and acceleration in three dimensional flow using cartesian coordinates.

c) Explain & define with help of drawing:
- pathline, streamline, streakline and stream tube.
- pressure measuring devices.
- Bulk modulus of elasticity of fluid.

PTO

4. A flow has a potential function $\phi = V_0(x^3 - 3xy^2)$, derive the corresponding stream function ψ and show that some of the streamlines are straight lines passing through the origin of coordinates. Find the inclinations of these lines. Evaluate also the magnitude and direction of the velocity at an arbitrary point: x, y.

5. Water is pumped from reservoir through 150 mm diameter pipe and is delivered at a height of 15 m from the center line of the pump through a 100 mm nozzle connected to 150 mm discharge line as shown in figure. If the pressure at the pump inlet is 210 kN/m² absolute, inlet velocity of 6 m/s and the jet is discharged to atmosphere. Determine:
- the energy added by the pump per unit weight of water flowing, E_p.
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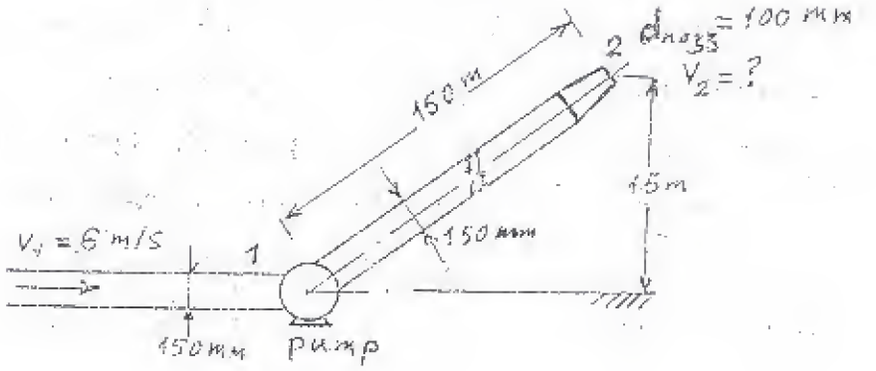
Assume atmospheric pressure as 101 kN/m² and no friction. $\gamma_w = 1000$ kg/m³.



جامعة طنطا - كلية الهندسة

قسم هندسة القوى الميكانيكية

الاقتصاد الهندسي - ثانية ميكانيكا قوى

الزمن : ساعتين

يناير 2008-2009

أجب على الأسئلة التالية

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ب - ماهى المصروفات السنوية لانشاء مع الشرح؟

ج- ماهو المبلغ الذى يجب استثماره فى الوقت الحالى فى حالة 5% ليكون كافيا للحصول على 12000 $ فى 5 سنوات من الان و 12000 $ فى 10 سنوات من الان و 12000 $ فى 20 سنة من الان؟

السؤال الثانى

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[أ] ما هو حجم الانتاج المطلوب فى الشهر للحصول على التعادل؟

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تكاليف المواد المباشرة $(L.E.)$	1300	1500	2000
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فإذا كانت مجموع المصروفات العامة (الثابتة Overhead Costs) السنوية لهذه الشركة هى $(5000\ L.E.)$ والمطلوب هو : حساب التكلفة الكلية لوحدة الإنتاج من كل نوع , وذلك باستخدام طريقتين مختلفتين من طرق توزيع المصروفات العامة المختلفة

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TANTA UNIVERSITY
FACULTY OF ENGINEERING
PRODUCTION ENG. & MECH. DESIGN DEPT.

THEORY OF MACHINES
2nd YEAR, 2008-2009
TIME: 3 HOURS

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(Mark 15%)

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Dr. Samy F. M. Assal

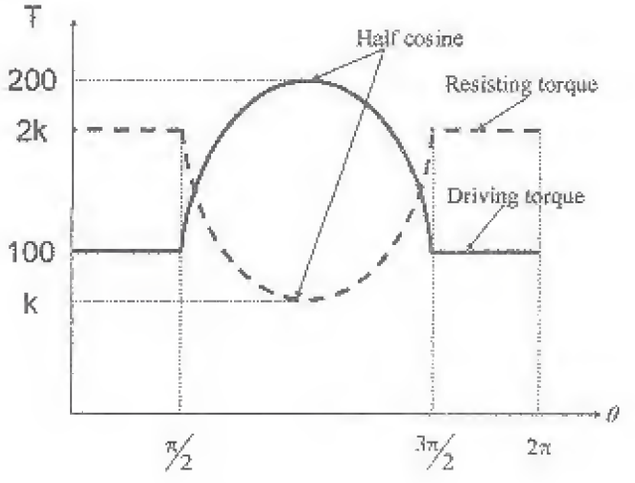


Fig. 1

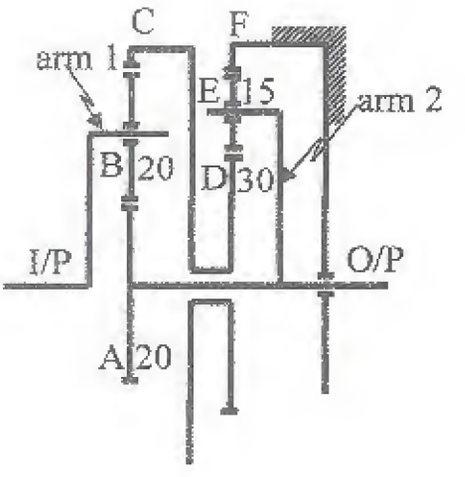
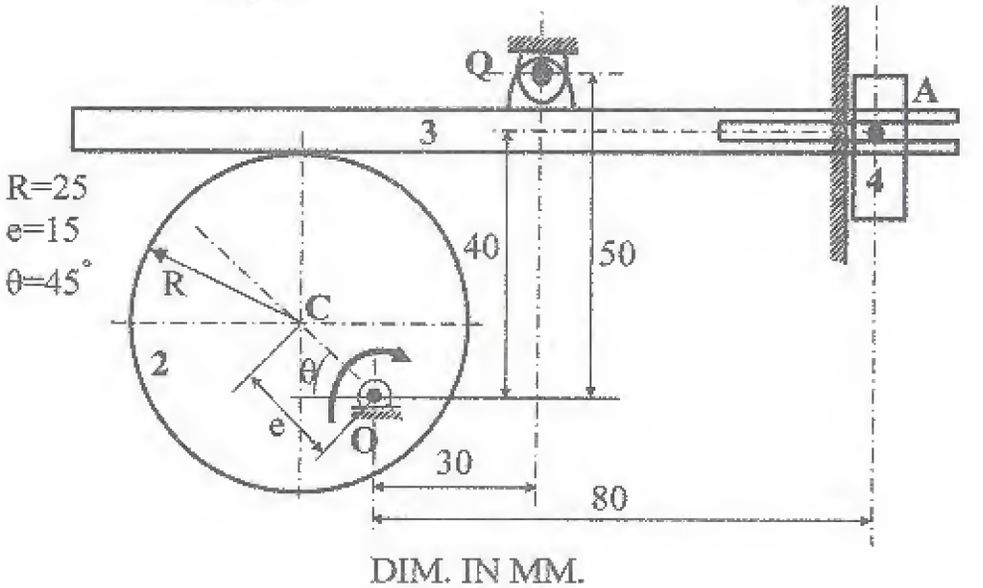


Fig. 2



DIM. IN MM.

Fig. 3

Answer the following questions:-

The first question:

a- What are the Carnot principles ?

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(b) the work of engine A and B.
(c) the heat rejected by the engine B.

The second question:

a- Define : exergy, second law efficiency, and exergy destroyed.

b- Is it possible for the entropy change of a closed system to be zero during irreversible process? Explain?

c- Steam enters a turbine steadily at 3 MPa and 450 °C at a rate of 8 kg/s and exit at 0.2 MPa and 150 °C. the steam is losing heat to the surrounding air at 100 kPa and 25 °C at a rate of 300 kW, and the kinetic and potential energy changes are negligible. Determine (a) the actual power output, (b) the maximum possible power output, (c) the second law efficiency, (d) the exergy destroyed, and (e) the exergy of the steam at the inlet conditions.

The third question:

a- What are the clearance volume, compression ratio and mean effective pressure for reciprocating engines ?

b- How does the ideal Ericsson cycle differ from the Carnot cycle?

c- An ideal Diesel cycle with air as the working fluid has a compression ratio of 18 and a cut off ratio of 2. at the beginning of the compression process, the working fluid is at 100 kPa, 27 °C and 2000 cm^3. Determine (a) the temperature and pressure of air at the end of each process, (b) the net work output and the thermal efficiency and (c) the mean effective pressure?

The forth question:

a- Why is Carnot cycle not a realistic model for steam power plants?

b- What is the cogeneration cycle?

c- A combined power plant consists of turbine unit and a steam turbine unit, the exhaust gas from the open-cycle gas turbine is the supply gas to the steam generator of the steam turbine cycle at which additional fuel is burned in the gas, the pressure ratio for turbine is 7.5, the air inlet temperature is 15 °C , and the maximum cycle temperature is 750 °C, combustion in the steam generators raises the gas temperature to 750 °C and the gas leaves the generators to the chimney at 100 °C. steam is supplied to the steam turbine at 50 bar, 600 °C, and the condenser pressure is 0.1 bar. The isentropic efficiencies of the air

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بسم الله الرحمن الرحيم

Engineering Faculty — Machine Design — Jan. 2009

2nd Year Mechanical — لائحة جديدة — Time : 3 hours

Answer all the following questions :

(1) A thick walled closed-end cylinder is made of an Al-alloy, has inside diameter of 200 mm and outside diameter of 800 mm. The cylinder is subjected to an internal fluide pressure of 150 MPa. Determine the principal stresses and maximum shear stress at a point on the inside surface of the cylinder. Also determine the increase in inside diameter due to fluid pressure ($E = 72$ GPa, $\mu = 0.33$).

(2) The shaft shown in Fig. (1) transmitts 40 KW between the input point A and the output point D at speed of 300 r.p.m. Calculate the shaft diameter if the yield stress of material is 300 MPa., the safty factor is 3.0

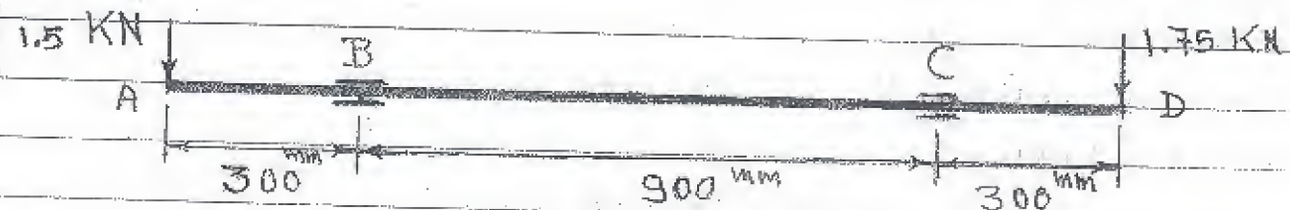


Fig. (1)

(3) A machine member is represented by a cantilever beam and loaded as shown in Fig. (2) the member has a circular cross-section and made from steel having a yield stress of 300 MPa. Calculate the diameter of this member. Assume factor of safty.

If the member is hollow and the inner to the outer ratio is 0.5, calculate the percentage change in the member weight.

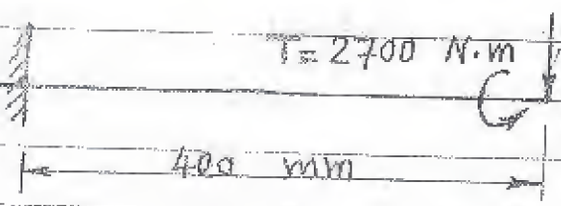


Fig. (2)

(4.) A bracket is riveted to a column by rivets of equal size as shown in Fig (3) it carries a load of 10 ton at a distance of 25 Cm from the center of the column.

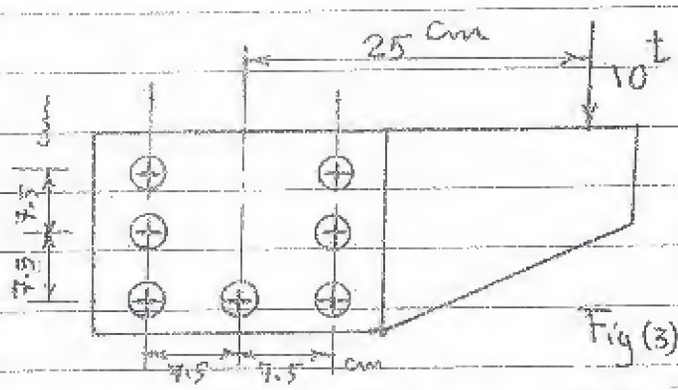


Fig (3)

If the maximum shear stress in the rivet is limited to 630 Kg/cm^2, find the diameter of the rivets.

(5) a- State the advantages and disadvantages of Belts Use.

b- A Flat belt has an elastomer envelope, is 200 mm wide, and transmits 60 KW at a belt speed of 5 m/s. The belt is used crossed configuration to connect a 300 mm driving pulley to a 900 mm diameter driven pulley at a shaft spacing of 6 m.

1- Calculate the belt tension based on a coefficient of friction of 0.38.

2- Calculate the minimum belt thick. if the allowable stress on the belt is 16 Kg/cm^2.

3- Compute the belt length and the angles of wrap.

End of Questions

Good Luck

Dr. H. M. Hendawy

Tanta University- Faculty of Engineering — Engineering Mathematic(3)
Phy. and Eng. Mathematics Department — Second year: Mechanical Power *Code:PME2113*
Production Engineering *Code: PME2112*

First Term Exam (28/1/2009) — Total Mark: 100 — Time: 3 hours

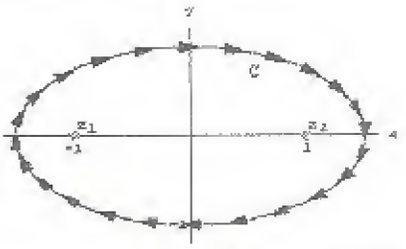
Answer the following:

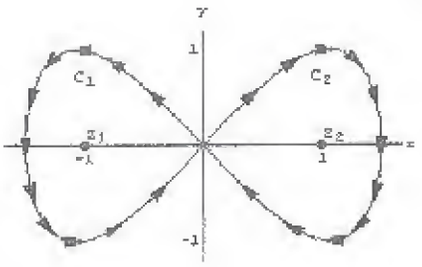
1- i) If $f(x,y)=u(x,y)+iv(x,y)$ is an analytic function show that $\frac{\partial f(x,y)}{\partial \bar{z}}=0$.

ii) Find the value of the integrals:

1- $\int_c e^{\frac{2}{z}}dz$ over the contour $c:|z|=1$. 2- $\int_0^{2\pi}\frac{1}{1+3\cos^2(\theta)}d\theta$. (20 Marks)

2- i) Evaluate $\int_c \frac{a}{(z^2-1)}dz$,where a is a constant, for the contours shown in the following two figures: (20 Marks)





ii) Show that: $\beta(n+\frac{1}{2},\frac{1}{2})=\frac{\pi}{2^{2n}}\frac{(2n)!}{(n!)^2}$.

iii) Prove that: $J_0^2(x)+2[J_1^2(x)+J_2^2(x)+J_3^2(x)+.....]=1$.

3- Find the points at which the following mapping $J(z)=z+\frac{1}{z}$ is not conformal, then use this mapping to explain that" **If the streamlines for a flow around the circle are known, then their images under the mapping $w=J(z)$ will be streamlines for a flow around the Joukowski airfoil**". (20 Marks)

4- Show that:

(i) $\Gamma(\frac{1}{2})=\sqrt{\pi}$. (ii) $\int_0^a x^4\sqrt{a^2-x^2}dx=\frac{\pi a^6}{32}$.

iii) Find the general solution of Bessel's differential equation:

$x^2y^{(2)}(x)+xy^{(1)}(x)+(x^2-\frac{4}{9})y(x)=0$. (20 Marks)

5- i) Use generating function of Bessel functions to prove that:

$\frac{2n}{x}J_n(x)=J_{n-1}(x)+J_{n+1}(x)$.

Then use it to express: $J_{3/2}(x)$ and $J_{-3/2}(x)$, in terms of $\sin(x)$ and $\cos(x)$.

ii) Prove that: $\int_0^\infty e^{2by-y^2}dy=\frac{\sqrt{\pi}}{2}e^{b^2}$. (20 Marks)

With my best wishes — Dr. Waheed K. Zahra

جامعة طنطا - كلية الهندسة
قسم هندسة القوى الميكانيكية

التخصص : هندسة القوى الميكانيكية

العام الجامعي ٢٠٠٨/٢٠٠٩
الفصل الدراسي الأول
السنة الدراسية : الثانية
الزمن : ٣ ساعات

المادة : ميكانيكا موائع (٢)

عدد الصفحات : ٢ | عدد الأسئلة : ٥ | أجب على جميع الأسئلة

1.a) Derive the Work-Energy equation using the control volume concept.

b) Derive the Euler equation for 2-D steady flow in vertical plane.

c) Using the derived Euler Equation, derive the Bernoulli's equation for 2-D incompressible steady flow

2.a) using the control volume concept, derive the law of mass conservation (Continuity equation) for 1-D steady flow.

b) Define with help of drawing: the stream function and velocity potential in cartesian coordinate system, then express and analyze the continuity equation and vorticity in terms of stream function and velocity potential.

c) Derive the fundamental equation of fluid statics relates pressure, density and vertical position in a fluid.

3.a) Determine the resultant liquid pressure force (magnitude, direction and point of action) acting on an inclined plane surface submerged in liquid.

b) Draw and assign the velocity and acceleration in three dimensional flow using cartesian coordinates.

c) Explain & define with help of drawing:
- pathline, streamline, streakline and stream tube.
- pressure measuring devices.
- Bulk modulus of elasticity of fluid.

PTO